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Remarks on the Physical Observations of Jupiter, made at the Adelaide Observatory, 1884–93. By E. P. Sells.

(*Communicated by Sir Charles Todd.*)

Drawings of *Jupiter* were made at the Adelaide Observatory, with the 8-inch Cooke refractor, from 1884 till 1893, with the exception of 1890.

It was early recognised that the utility of the drawings would be much increased if the two following conditions were complied with:—

(1) The drawings to be arranged for publication, not in the usual way of separate discs for each drawing, but on some cylindrical form of projection, allowing of easy comparison between the results obtained on different nights.

(2) As many drawings as possible to be taken on each night of observation, four or five drawings on one night being preferable to one drawing on each of four or five nights.

With regard to condition (1), the form of projection chosen was the orthographic, being the most natural projection for *Jupiter*. The drawings at the telescope were made on blank elliptical discs, as is usual, and were afterwards plotted on a chart having its polar diameter equal to that of the elliptical disc, the longitudes being taken from Marth's "Ephemeris," System II.

It will be seen from the accompanying planisphere that each night of observation has a chart to itself, and the different charts are arranged one below the other, and are separated from each other by only a thin black line, thus allowing of easy comparison *inter se*. The number of charts on a sheet is of necessity limited by the size of the publication of which they form a part, but it is, of course, an advantage to have as many charts as possible on each sheet. No latitude parallels are shown, as they would only confuse the eye, but meridians are given to every 30°, and along the top and bottom of the sheet to every 10°.

With regard to condition (2), drawings were made as nearly as possible at intervals of fifty minutes, answering to a difference of 30°·2 Jovian longitude. Attempts were made to secure sets of drawings showing the whole of *Jupiter's* surface during one revolution of the planet, but in no case was this satisfactorily accomplished, although on 1889 June 23–24 G.M.T. nine drawings were secured, of which the first and last slightly overlapped, so that on the planisphere the whole disc is delineated. On all occasions, however, observations were interrupted either by cloud or by a south-easterly breeze, the lightest breath of air from that quarter sufficing to destroy the quality of the definition, so that the true forms of the markings could not be made out, and all delicate detail vanished. Great attention has been paid at Adelaide to giving the markings their true forms (as they

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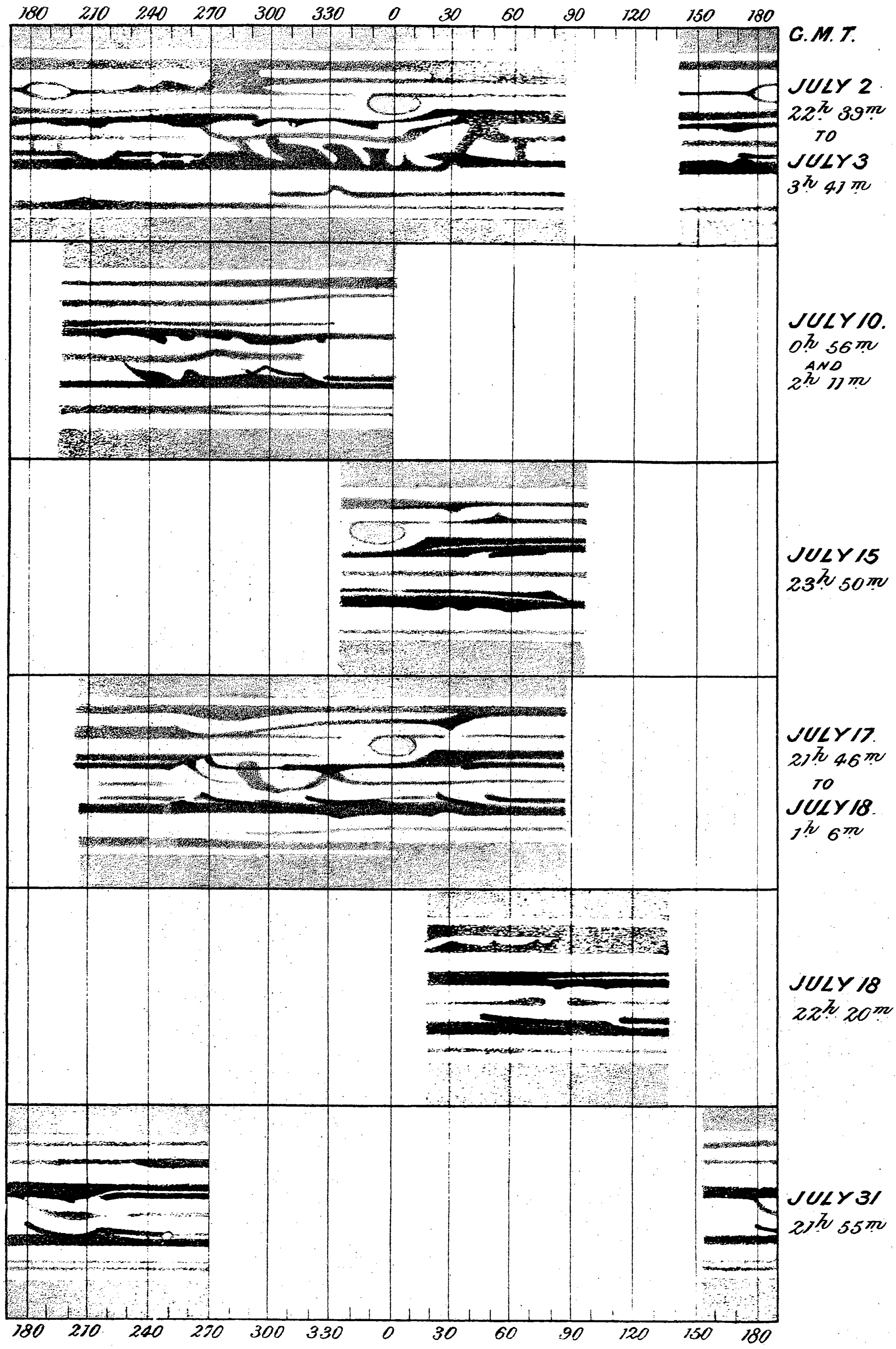
JUPITER, 1889.



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appeared to the observer) and definite, but not necessarily hard, outlines have been drawn whenever possible.

In all, 217 drawings have been plotted on the charts, ranging in date from 1884 February 25 to 1893 December 11.

At no time have the Polar and Temperate Regions shown much detail, but this is, of course, partly due to the foreshortened view that is obtained of those portions of the planet. The outburst of small dark spots in 1891 on the southern edge of the North Temperate Belt was remarkable, especially when taken in conjunction with the somewhat similar outburst in 1880 and 1881, but this has been sufficiently commented on by other observers. After the outburst had subsided, and during the apparitions of the planet in 1892 and 1893, this belt had become very dark, and towards the end of 1893 was the darkest marking on the planet. In South Temperate Regions perhaps the chief feature has been the trains of small round white spots that sometimes make their appearance, of which there are numerous instances among our drawings. Also noticeable are the short dark belts that form in about latitude 25° S., of which the most conspicuous examples are the two that were visible in 1891, one of them being of a very dark reddish colour. An interesting feature was the appearance of a small dusky spot in 1884, 1886, and 1889, interrupting the line of the South Temperate Belt. The spots may not have been identically the same, but were very similar in appearance. Two drawings, showing the spot as it appeared in 1884 and 1889, respectively, accompany this paper. In 1884 it was seen on March 20 (long. 144°·5) and April 6 (long. 128°·9), and then appeared as a small circular dusky spot with a clear space all round it, interrupting the line of the narrow Belt 6 (see *Monthly Notices* for April 1891, p. 404), while the south polar shading, separated from Belt 6 by a very narrow white space, had its northern contour hollowed out immediately south of the spot, and also had a darker degree of shading at the same place.

In 1886 a pear-shaped spot was seen in the same latitude. Again it interrupted the line of Belt 6, and again the south polar shading had a darker shade immediately south of the spot; but there was no dip southwards of the edge of the shading as in 1884, perhaps because the white space was much broader between the shading and Belt 6. The spot was noticed on February 3 (long. 73°), February 8, and February 22, but after that was not seen again until 1889, when a similar spot made its appearance in the same latitude. In 1889 the spot and Belt 6 were darker and broader than formerly, and the belt appeared joined on to a band of shading to the south. The longitude of the spot 1889 June 25 at 0^h 24^m G.M.T. was 141°·2.

The equatorial regions during some apparitions of the planet showed a large amount of detail, but during others the markings were few. There have always been, during the period 1884–1893 the two chief belts, the North and South Equatorial Belts, though in 1884 the North Equatorial Belt was broken up along

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part of its length into short disconnected belts. In 1885 the belt was continuous and had become far more conspicuous, while in 1886 it showed a fair amount of structural detail. Only a few drawings were taken here in 1887 and 1888, but the belt still showed a quantity of detail, as was also the case in 1889. No observations were taken in 1890, but in 1891 the belt had a more regular outline, and had become very narrow and dark along part of its course. It appeared to consist of two different layers of matter, one very dark and narrow, and the other fainter and broader, the dark, narrow layer coming to a clearly defined end within the lighter broad layer.

The two dark spots on the northern component of the double portion of the belt, in longs. 220°–255°, were seen and drawn on five nights.

In 1892 and 1893 the belt had become still narrower, and showed very little detail, but towards the end of 1893 it was getting broader again, and was double for part of its length.

The South Equatorial Belt has always been a conspicuous marking. It is generally, but not always, divided longitudinally by a white streak, while sometimes a white streak will cross it at a considerable angle. Perhaps the most usual appearance of this belt, as seen at Adelaide, has been that of a comparatively lightly shaded belt, divided longitudinally by a white streak, and having superposed upon its northern component other dark belts, short in length, and frequently with a club-shaped termination projecting into the bright equatorial zone, and forming the bases from which spring the festoons and other shadings that appear on that zone.

When observations were begun in 1884 the Great Bay in the southern edge of the South Equatorial Belt, north of the Great Red Spot, was a conspicuous feature, and was symmetrically shaped, the angular shoulders on either side being similar to one another. On 1884 April 20 at $20^{h}\ 37^{m}$ G.M.T. the *preceding* angle of the Great Bay was found to be exceptionally sharp and well defined, and appeared of a deep blood-red colour, fading off towards the preceding limb. The colour was most marked. In 1885 this angular shoulder on the *preceding* side of the Great Bay had disappeared, except that a narrow faint line was sometimes visible in the position of its southern edge, nor did it appear again up to the end of 1893.

In 1892 and 1893 the belt showed very little detail, and there was a striking absence of markings on the bright equatorial zone, all the equatorial regions of the planet appearing to be in a state of comparative quiescence.

[In addition to the chart reproduced, Mr. Sells also sent a chart for 1888, which is placed in the Library.]